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# THE FACILITATION OF ATTENTION UTILIZING THERAPEUTIC SOUNDS

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When each ear is presented simultaneously with a pure tone signal, and these tones differ by only a small amount (from 1 to 25 Hz), they continually mesh in and out of phase with each other to produce a binaural beat. According to Atwater (1996) “the binaural beat [is] perceived as a fluctuating rhythm at the frequency of the difference between the two auditory inputs” (p. 4). Apparently the binaural beats are generated in the brain stem and are associated with a pattern of electrical activity over the surface of the cortex known as the frequency following response, which can be measured by an electroencephalograph. Morris (1991) says: “For example, if the individual listens to a tone with the frequency of 440 Hz in one ear and another tone of 444 Hz in the other ear, a binaural beat of 4 Hz will be produced. This electrical signal occurs with relatively equal frequency and strength in both hemispheres of the brain and creates a synchronization of the two sides of the brain. Because of this synchronization, Monroe has called this effect Hemi-Sync®” (p. 281).

Research investigations of brain activity patterns demonstrate that particular states of consciousness are associated with some of these patterns. Thus, the delta pattern (0.5 to 4 Hz) is associated with sleep, the theta pattern (4 to 8 Hz) with deep states of meditation, the alpha pattern (8 to 12 Hz) with relaxation, and the beta pattern (12 to 30 Hz) with concentration. What Hemi-Sync is apparently able to do is to create the possibility of attaining any one of these states of consciousness by varying the frequencies of the pure tones delivered to each ear, as well as by varying the differences between the two frequencies. Delivering the relevant frequencies to the listener’s ears, however, is only one factor in attaining a particular state of consciousness. The listener must be cooperative and in a receptive state of mind in order for the signals to work. In other words, it is not automatic. One can reject the effect if one so chooses.

Research with this technology is promising. Edrington (1984) used Hemi-Sync® "cognitive learning enhancement tapes" with college students taking an Introductory Psychology course (Tacoma Community College, spring 1981). There were two sections taking the same course. One listened to Hemi-Sync during class, the other did not. Six tests were administered during the semester. In all but the first test, the students listening to the Hemi-Sync tapes scored, on the average, approximately ten points higher on each of the tests. The likelihood that these differences were the result of chance factors was no more than two times in a hundred.

Morris (1991) reported that when Hemi-Sync relaxation music was added to an ongoing program of remediation therapy with twenty developmentally disabled children suffering from feeding and pre-speech problems, fifteen of them showed positive changes in the problematic behaviors, including improvements in focus of attention, overall sensory organization, and motor coordination. Physical relaxation increased and there was a corresponding reduction in fearfulness and tactile defensiveness. According to Morris, "All of the children exhibited a greater openness and enthusiasm for learning" (p. 284).

Robert Sornson, executive director of special education for Northville Public Schools, Northville, Michigan, and fellow Monroe Institute Professional Members have investigated the use of Hemi-Sync with people suffering from attention deficit disorder (ADD). Sornson (Bullard 1995) noted that people with ADD exhibit lower levels of glucose metabolism in their brains. Generally they use less oxygen across the cerebral cortex, produce brain waves that are somewhat slower than normal, and have difficulty maintaining the high levels of arousal associated with sustained alertness and focused attention. The Hemi-Sync *Remembrance* tape that was employed was designed to foster quantum learning and peak performance. Although no formal investigation was carried out, reports from teachers and parents administering the Attention side of the *Remembrance* tape to children diagnosed with ADD indicate that the faster beta frequencies embedded in the music have resulted in improvements in the children's focus of attention.

According to Zigler and Finn-Stevenson (1987) ADD children "tend to move from one site to another, they are unable to inhibit action, and they are constantly diverted by sounds and objects. Not only are the children chaotic in their behavior, they also tend to forget what they are told to do, and they seem at a loss when asked to engage in sequentially ordered behaviors (for example, when they are asked to go outside and fetch something)" (p. 460). These same symptoms—short attention span, distractibility, hyperactivity, impulsiveness, and emotional instability—can be seen in a number of mentally retarded/developmentally disabled (MR/DD) adults in day treatment settings. So if Hemi-Sync can improve the focusing ability of ADD children, can it perform a similar function with these MR/DD adults? To find out, we created a pool of twenty mentally retarded adults from members of our program population who expressed a willingness to participate in the study, matched them on the basis of IQ (Leiter International Performance Scale), then randomly assigned them to either an

experimental or a control group. Both groups attended approximately fifteen sessions of one-half hour each extending over a two-month period.

The subjects in both groups sat in a double column of five rows placed in the center of a room approximately twenty feet by twenty feet equipped with large stereo speakers at the far ends of the back wall. Both groups watched nature videos without the sound tracks and listened to the *Attention* side of the *Remembrance* tape for thirty minutes per session. The only difference in the treatment given to the experimental and control groups was the Hemi-Sync signal which was present in the experimental condition and absent in the control. Before the treatment began and again after it was terminated, each subject was administered three subtests of the Wechsler Adult Intelligence Scale, each of which demands some degree of focused attention. The first, a test of short-term auditory memory, requires subjects to immediately repeat (forward or backward) sets of numbers spoken to them. Matarazzo (1972) noted that "difficulty in the reproduction of digits correlates with lack of ability to perform tasks requiring concentrated effort" (pp. 204-5). In the Block Design Test, which requires the subject to reproduce patterns of red and white blocks, the subject must simultaneously attend to both color and pattern in solving the problem. Finally, the Digit Symbol Test, which requires the subject to associate certain symbols with the numbers one through nine, perhaps more than the other two subtests, demands sustained focus throughout the whole test.

In addition to these measures, six five-point Likert type scales were created to measure various aspects of attentiveness. Two clinician-raters, both former teachers and both familiar with all of the participants in the study, rated each subject both before and after the treatment. The conditions under which they rated the participants were constant and tightly scripted. Each participant was introduced to the study, asked the same questions, and required to perform the same tasks. Their responses to the requirements of the situation provided the basis for the ratings. Also, the raters were unaware, throughout the experiment, of the composition of the groups. The ratings from each rater for each participant on each measure were averaged. Rater agreements on the six scales are shown in Table 1.

TABLE 1
Rater Agreement* on Six Measures of Attentiveness and Associated Behavior

| SCALE | Pearson's | P |
|---|---|---|
| | r | values** |
| Attention to Task | .63 | .005 |
| Memory for Instructions | .91 | .000 |
| Resistance to Distractions | .81 | .000 |
| Attention to Speech | .62 | .006 |
| Level of Alertness | .36 | .142 |
| Level of Irritability | .71 | .001 |

* As mentioned by Pearson's product-moment correlation coefficient (r)

** P values represent probability that the associated r would have occurred by chance alone.

Following the last treatment session, subjects were retested and rerated. Difference scores were created by subtracting the scores they obtained on each test and rating scale before the treatment began from those obtained after the termination of the treatment. Positive scores indicate improvement. Scores of zero reflect no change. Negative scores indicate deterioration of performance. For both test scores and average ratings, the Mann-Whitney U Test was used to determine if the differences obtained from the two groups were likely to be the result of chance alone, or whether they represented a real effect.

TABLE 2
Average Differences in Raw Scores (Before and After)
of Measures of Short-Term Auditory Memory and Perceptual-Motor Skills

| SCALE | MUSIC PLUS HEMI-SYNC | MUSIC ONLY | MANN-WHITNEY U STATISTIC |
|---|---|---|---|
| Digit Span | +0.1 | 0.0 | 75 |
| Block Design | +1.6 | -1.1 | 54 |
| Digit Symbol | +2.8 | -1.4 | 50* |

* Differences significant at the .05 level of confidence.

TABLE 3
Average Differences in Ratings (Before and After)
of Six Measures of Attentiveness and Associated Behavior

| SCALE | MUSIC PLUS HEMI-SYNC | MUSIC ONLY | MANN-WHITNEY U STATISTIC |
|---|---|---|---|
| Attention to Task | -1.0 | -2.0 | 54 |
| Memory for Instructions | +1.3 | -0.9 | 86 |
| Resistance to Distractions | +0.5 | -1.0 | 46* |
| Attention to Speech | +1.3 | -0.5 | 46* |
| Level of Alertness | +0.5 | 0.0 | 58 |
| Level of Irritability | +1.0 | -0.9 | 48* |

* Differences significant at the .05 level of confidence.

In Table 2 we see that for the group exposed to the Hemi-Sync signal, all difference scores were, on the average, positive. By contrast, the average difference scores obtained by the group denied the Hemi-Sync signal were generally negative. Only in the case of the Digit Symbol Test, however, were the differences between the two groups significant, which is to say, not likely the result of chance. (You would expect to obtain differences as great as these only five times in a hundred by chance alone.)

In Table 3 we find a similar pattern. The difference scores obtained by the group exposed to the Hemi-Sync signal were, for the most part, positive, while the difference scores obtained by the control group were predominantly negative. Apparently, repeated exposure to the Hemi-Sync signal resulted in small but real improvements in focusing ability as expressed by increased resistance to distraction and attention to speech. In addition, those people exposed to the signal appeared more serene (less irritable) than their counterparts in the control group. These results seem to confirm earlier anecdotal findings regarding the focusing effect produced by repeated exposure to the beta-inducing frequencies embedded in the *Remembrance* tape. Interestingly, when asked if they would like to continue the sessions, all members of the experimental group, but only two or three members of the control group, raised their hands. In fact, for several weeks after the termination of the experiment, we were approached almost exclusively by former experimental group members asking when the sessions were to begin again.

From a practical standpoint the obtained increases in focused attention were—while real—not overly large. Nor did it seem that the effects had generalized appreciably to classroom behavior. A second study has been inaugurated to determine if greater exposure to the Hemi-Sync frequency patterns (longer sessions and more sessions) results in greater increases in attentiveness. This is being explored by exposing selected participants to the Hemi-Sync signal in twice-weekly individual sessions during which they are required to play computer games demanding sustained attention. Scores per game and number of games per session are being recorded. The early sessions (with no Hemi-Sync signal present) have been devoted to obtaining baseline data. Later, Hemi-Sync sessions will continue for a minimum of six months in order to gauge the long-term effects of the signal upon attentiveness.

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